

BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1927

ROYAL BOTANIC GARDENS, KEW

XXVI.—SANTALUM, EUCARYA, AND MIDA. T. A. SPRAGUE AND V. S. SUMMERHAYES.

In response to an enquiry received from the Forestry Department, Western Australia, as to the generic status of *Fusanus* R.Br. (*Santalaceae*), and particularly as to whether it should be included in *Santalum* L., an investigation into the taxonomy and nomenclature of these and allied genera has been undertaken with the following result.

I. Taxonomy.

Alphonse de Candolle (DC. Prodr. xiv. 681, 684: 1857), merged *Fusanus* R.Br. in *Santalum* L. In this he has been followed by F. Mueller (First Cens. Austral. Pl. 64: 1882; Second. Cens. III: 1889) and C. Moore (Fl.N.S.W. 226: 1893), but all other Australian botanists have followed the Genera Plantarum and Pflanzenfamilien in recognising them as distinct genera. *Santalum* may be distinguished by the relatively long campanulate, cylindrical, ovoid or obconical perianth-tube, the tongue-like projections of the otherwise adnate disc, and the slender elongated style. *Fusanus* R.Br.,* on the other hand, has a shortly cupular or patelliform perianth-tube, very short subtruncate interstaminal disc-lobes, much broader than long, and a very short stout conical style or the stigmas sessile. An examination of several related genera of *Santalaceae* has shown that the differences between what are generally regarded as distinct genera in this family are at any rate no greater than those subsisting between *Santalum* and *Fusanus* R.Br.; and it therefore seems undesirable to unite the latter genera. *Fusanus* R.Br. differs from *Colpoön* Berg, with which it was united by Robert Brown under the name *Fusanus* L.† in having a distinct, though sometimes greatly flattened perianth-tube and, except in the single New Zealand species, in the flowers being hermaphrodite. It includes two very distinct sections, namely, *Eufusanus* Benth. (Australia), and *Mida* (A. Cunn.) Benth. (New Zealand), the former approaching *Colpoön* in the much flattened perianth-tube of *F. persicarius*, and the latter resembling *Colpoön* in its tendency to unisexuality. The separation of these two sections as distinct genera would make it easier to diagnose them from *Santalum* on the one hand and from *Colpoön*

* It is necessary, in order to avoid ambiguity, to append the authority "R.Br.," because, as explained on p. 195, the name *Fusanus* is properly applicable only to *Fusanus* Murr., a synonym of *Colpoön* Berg.

† The correct citation would have been *Fusanus* Murr., since Linnaeus was not responsible for the name.

on the other. The logical result of the union of any two of the four genera in question would be the recognition of a single genus comprising these four as well as *Rhoiacarpus* and *Osyris*, which would serve no useful purpose. Baillon (Hist. Pl. xi. 421, 463: 1892) actually merged *Fusanus* R.Br. and *Colpoon* Berg in *Santalum*, though he kept *Osyris* distinct, but his generic description of *Santalum* excludes *Colpoon*, which has declinous flowers and no free perianth-tube. Benth and J. D. Hooker (Gen. Pl. iii. 226: 1880) pointed out that *Acanthosyris*, *Santalum*, *Comandra*, *Fusanus*, *Mida*, *Colpoon*, *Rhoiacarpus* and *Osyris* are closely related, and might be regarded as sections of a single genus, but that the union of *Santalum* and *Osyris* would hardly be accepted by botanists. So far as our own investigations have gone, the genera *Santalum*, *Mida*, *Eucarya* (i.e. *Fusanus* Sect. *Eufusanus*), *Rhoiacarpus*, *Colpoon* and *Osyris* seem to form a fairly natural series. *Colpoon* is undoubtedly related to *Osyris*, to which it has been reduced by some authors (A.DC. in DC. Prodr. xiv. 632, 634: 1857; A. W. Hill in Dyer, Fl. Cap. v. Sect. 2, 209: 1915), and *C. compressum* indeed resembles *O. abyssinica* so closely that it has sometimes been regarded as a mere synonym. The sessile stigmas of the former, however, afford a distinguishing character which may be utilised even in the fruiting stage.

A consideration of the diagnostic characters of *Eufusanus* and *Mida* seems to justify their recognition as separate genera. *Eufusanus* has an inferior ovary, a patelliform perianth-tube, strictly hermaphrodite flowers, and globose or subglobose fruits. *Mida* has a semi-inferior ovary, a shortly cupular perianth-tube, flowers sometimes unisexual, and turbinate fruits. In a paper (Trans. N.Z. Inst. lvii. 57: 10th March, 1927) received at Kew after the present article was in the printers' hands, Cockayne and Allan have independently arrived at the same conclusion as regards the separate generic status of *Mida*.

While examining the species of the above-mentioned genera, it was noticed that *Santalum fernandezianum* F. Phil., a native of Juan Fernandez, differed from all the other species of *Santalum* in its shortly cupular perianth-tube and sessile stigmas, characters which at once suggested that it might be congeneric with *Mida*. Examination of two flowers from a specimen collected by Söhrns confirmed this view, and we accordingly transfer *S. fernandezianum* to *Mida*. Neither the figures of the disc-lobes given in Hook. Ic. Pl. t.2430 nor those given by Johow, Fl. Juan Fernandez, 132, quite agree with our observations: the shape of the lobes in the two flowers examined is rather variable, but on the whole relatively broader than in the figures cited. They approach, however, the form of lobe characteristic of *Santalum*, which doubtless explains why the species was originally referred to that genus, instead of to *Fusanus* R.Br., undue prominence, in our opinion, having been given to this character in the keys in the Genera Plantarum and Pflanzenfamilien.

It now remains to determine the correct generic names of *Eufusanus* and *Mida*.

II. Nomenclature.

The name "*Fusanus* R.Br.", has been applied to a group of 5 species (four from Australia and one from New Zealand) in Benth. & Hook. f. Gen. Pl., Engler & Prantl, Nat. Pflanzenfam. and Cheeseman, Man. N.Z. Fl., but as this application of the name *Fusanus* is merely the retention of a wrong identification, the species concerned must bear another generic name or names (vide Journ. Bot. 1922, 138, No. 16). The name *Fusanus* was originally given by Murray (Linn. Syst. Veg. Ed. 13, 765: 1774) to a South African species, *F. compressus*, which has proved to be identical with *Colpoon compressum* Berg. (Descr. Pl. Cap. 38, t.1, fig. 1: 1767), the type species of the genus *Colpoon* Berg. *Fusanus* Murray is therefore a mere synonym of *Colpoon*. Robert Brown (Prodr. 355: 1810) adopted the later name *Fusanus*, citing the earlier name *Colpoon* as a synonym, and added three Australian species.

A. de Candolle (DC. Prodr. xiv. 684, 685: 1857) transferred the three Australian species of *Fusanus* to *Santalum* sect. *Eusantalum*, § 2 (Stylus abbreviatus et ideo stigmata infra antheras sita) and proposed a second section, *Mida*, based on the genus *Mida* A. Cunn. (Ann. Nat. Hist. 1. 376: 1838) which W. J. Hooker (Ic. Pl. tt. 563, 575: 1843) had already transferred to *Santalum*.

Bentham (Fl. Austral. vi. 215: 1873) used the name "*Fusanus* Linn." for a genus comprising the three Australian species of *Fusanus* described by Brown, *Santalum persicarium* F. Muell. and the genus *Mida* A. Cunn. He stated that the genus *Fusanus* was limited to Australasia, thus excluding the type-species, which is a native of South Africa. He cited *Eucarya* T. L. Mitchell (Three Exped. ii. 100: 1839) as a synonym. The genus, as thus circumscribed, clearly cannot bear the name *Fusanus* under International Rules, since it does not include Murray's original species. Two names, *Mida* A. Cunn. ex Endl. (1837) and *Eucarya* T. L. Mitch. (1839) are available for the genus as defined by Bentham, Hieronymus and Cheeseman, and as generally accepted nowadays. Of these *Mida* has priority of publication and should be accepted by those who prefer to retain *Eufusanus* and *Mida* in a single genus, as has already been pointed out by Kuntze (Rev. Gen. ii. 588: 1891; Post & Kuntze, Lexik. Gen. Phan. 1367: 1903).

If they are separated generically, as recommended above, the four Australian species should bear the name *Eucarya* Mitch. As this was published without an adequate description, we supply short diagnoses of *Eucarya* and *Mida*.

III. Enumeration of genera and species (*Eucarya* and *Mida*).

***Eucarya* T. L. Mitch.** Three Exped. ii. 100 (1839), cum ic., nomen subnudum, nunc descriptum. *Fusanus* R.Br. Prodr. 355 (1810), partim; Benth. Fl. Austral. vi. 215 (1873), excl. sp. Nov.-Zeland., non Murr. *Santalum* sect. *Eusantalum*, § 2, DC. Prodr. xiv.

684 (1857), excl. *S. insulare* Bert. *Fusanus* sect. *Eufusanus* Benth. & Hook. f. Gen. Pl. iii. 225 (1880); Hieron. in Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 1, 217 (1889). *Mida* sect. *Eucarya* Kuntze in Post & Kuntze, Lexik. Gen. Phan. 367 (1903).

Species 4, omnes australienses.

Flores hermaphroditi. *Perianthii tubus* supra ovarium patelliformis. *Disci lobi* brevissimi, lati, subtruncati. *Ovarium* inferum; stylus brevissimus, crassus, vel nullus. *Fructus* globosi vel subglobosi. *Folia* opposita vel ternatim verticillata.—Confer icones in Maiden, For. Fl. N.S.W. i. t.16.

1. **E. acuminata** (R.Br.) nob., comb. nov.—*Fusanus acuminatus* R.Br. Prodr. 355 (1810); Benth. Fl. Austral. vi. 215 (1873); Turner, Forage Pl. Austral. 91 (1891), cum ic.; Bailey, Queensl. Fl. 1386 (1902); J. M. Black, Fl. S. Austral. 168 (1924). *Santalum preissianum* Miq. in Lehm. Pl. Preiss. i. 615 (1844-5); F. Muell. Sel. Extra-trop. Pl. ed. ix. 491 (1895). *Santalum acuminatum* A.DC. in DC. Prodr. xiv. 684 (1857); F. Muell. First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); C. Moore, Fl. N.S.W. 226 (1893). *Mida acuminata* Kuntze, Rev. Gen. ii. 589 (1891).

2. **E. murrayana** T. L. Mitch. Three Exped. ii. 100 (1839), cum ic.—*Santalum persicarium* F. Muell. in Trans. Vict. Inst. 41 (1855); First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); C. Moore, Fl. N.S.W. 226 (1893). *Fusanus persicarius* F. Muell. ex Benth. Fl. Austral. vi. 216 (1873); Bailey, Queensl. Fl. 1386 (1902); J. M. Black, Fl. S. Austral. 168 (1924). *Mida persicaria* Kuntze, Rev. Gen. ii. 589 (1891).

3. **E. spicata** (R.Br.) nob., comb. nov.—*Fusanus spicatus* R.Br. Prodr. 355 (1810); Benth. Fl. Austral. vi. 217 (1873); J. M. Black, Fl. S. Austral. 168 (1924), fig. 41, F.G. *Santalum spicatum* A.DC. in DC. Prodr. xiv. 685 (1857). *Santalum cygnorum* Miq. in Lehm. Pl. Preiss. i. 615 (1844-5); F. Muell. First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); Sel. Extra-trop. Pl. ed. ix. 491 (1895). *Mida cygnorum* Kuntze, Rev. Gen. ii. 589 (1891).

4. **E. crassifolia** (R.Br.) nob., comb. nov.—*Fusanus crassifolius* R.Br. Prodr. 355 (1810); Benth. Fl. Austral. vi. 217 (1873). *Santalum crassifolium* A.DC. in DC. Prodr. xiv. 685 (1857); F. Muell. First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); C. Moore, Fl. N.S.W. 226 (1893). *Mida crassifolia* Kuntze, Rev. Gen. ii. 589 (1891).

Several other species described by Miquel and De Candolle were cited by Bentham as synonyms of the first three, but the descriptions are insufficient to determine them with certainty. Further material of *Eucarya* is required before a detailed revision of the genus can be undertaken.

Mida A. Cunn. ex Endl. Gen. Pl. 327 (1837); A. Cunn. in Ann. Nat. Hist. i. 376 (1838). *Santalum* sect. *Mida* A.DC. in DC.

Prodr. xiv. 686 (1857). *Fusanus* sect. *Mida* Benth. & Hook. f. Gen. Pl. iii. 225 (1880); Hieron. in Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 1, 218 (1889). *Mida* Sect. *Eumida* Kuntze in Post & Kuntze, Lexik. Gen. Phan. 367 (1903).

Species 2, altera Novae-Zelandiae, altera insularum chilensium Juan Fernandez incola.

Flores hermaphroditi vel unisexuales. *Perianthii* *tubus* supra ovarium breviter cupularis. *Disci* *lobi* aut brevissimi, latissimi, subtruncati (*M. salicifolia*), aut irregulariter trapezoidei vel subquadrati (*M. fernandeziana*). *Ovarium* semi-inferum; stylus nullus. *Fructus* turbinati. *Folia* alterna vel opposita.—Confer icones in Hook. Ic. Pl. tt. 563, 575; Cheeseman, Ill. N.Z. Fl. t. 177; Hook. Ic. Pl. t. 2430.

1. *M. salicifolia* A. Cunn. in Ann. Nat. Hist. i. 376 (1838), emend. Kuntze, Rev. Gen. ii. 589 (1891) incl. *M. eucalyptoides* A. Cunn. l.c. et *M. myrtifolia* A. Cunn. l.c. 377. *Santalum mida* Hook. Ic. Pl. tt. 563, 575 (1843), nomen abortivum. *Santalum cunninghamii* Hook. f. Fl. Nov. Zel. i. 223 (1854), nomen abortivum; A.DC. in DC. Prodr. xiv. 686 (1857); Hook. f. Handb. N.Z. Fl. 247 (1864). *Mida cunninghamii* Chatin, Anat. Veg., Pl. Paras. 361 (1856-91). *Fusanus cunninghamii* Benth. & Hook. f. ex T. Kirk, For. Fl. N.Z. 137, tt. 75, 76 (1889); Cheesem. Man. N.Z. Fl. ed. 1, 624 (1906); Cheesem. Ill. N.Z. Fl. t. 177 (1914); Cheesem. Man. N.Z. Fl. ed. 2, 388 (1925). *Santalum salicifolium* Meurisse, in Bull. Soc. Linn. Par. ii. 1026 (1892). *Fusanus eucalyptoides* Druce, in Rep. Bot. Exch. Club Brit. Isles, 1916, 623 (1917).

NEW ZEALAND. North Island, from North Cape to Cook Strait.

Under International Rules (Art. 46, 48) this species, as circumscribed by the Hookers and by Cheeseman, must bear one of the three names given to it by A. Cunningham. W. J. Hooker, on reducing *Mida* to *Santalum*, united Cunningham's three species under the new name *S. mida*, which is consequently a nomen abortivum, as is also *S. cunninghamii* Hook. f. W. J. Hooker selected *M. salicifolia* A. Cunn. as the var. *a* of *S. mida*, and Kuntze (Rev. Gen. ii. 589; 1891) chose *M. salicifolia* in preference to *M. eucalyptoides* and *M. myrtifolia*; this choice cannot be modified by subsequent authors (Internat. Rules, Art. 46).

As a result of investigations in the field, Cockayne and Allan (Trans. N.Z. Inst. lvii. 57: 1927) accept *M. salicifolia* and *M. myrtifolia* as independent species, and suggest that *M. eucalyptoides* may be a hybrid between them. From Cunningham's descriptions of *M. salicifolia* and *myrtifolia* we are unable to draw a line between these two species in the herbarium, and await further descriptions of them by Cockayne and Allan before coming to a definite conclusion.

2. *M. fernandeziana* (Phil.) nob., comb. nov.—*Santalum fernandezianum* F. Phil. in Anal. Mus. Nac. Santiago, Bot. 1892, 5;

F. & R.A. Phil. Bot. Abhandl. 3 (1893); Oliver in Hook. Ic. Pl. t. 2430 (1896); Johow, Fl. Juan Fernandez 127-133 (1896); Skottsberg, Nat. Hist. Juan Fernandez ii. 117 (1922). *Santalum album* Gay, Fl. Chil. v. 326 (1849), quoad loc. Juan Fernandez tantum, excl. descr., non L.

JUAN FERNANDEZ. Masatierra. Now extinct, the last known tree having died between 1908 and 1916. According to Skottsberg (l.c.) semi-fossil wood of a species of *Santalum* has been found on Masafuera.

IV. Geographical Distribution of the Genera.

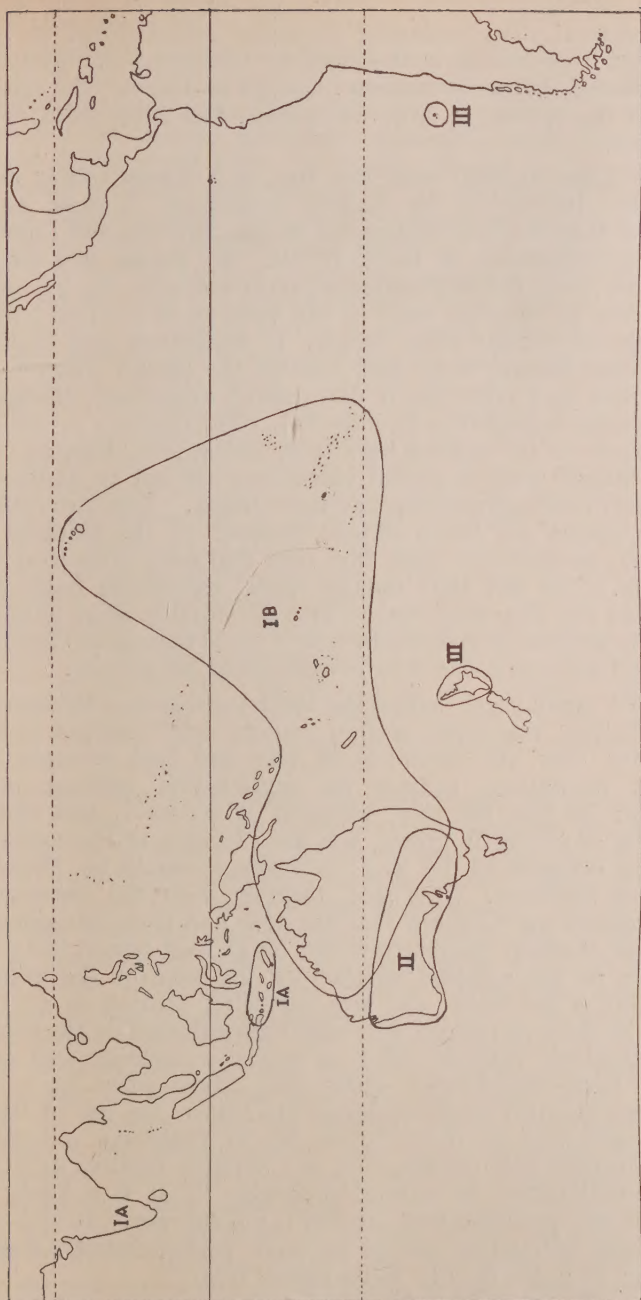
The geographical distribution of the three genera is shown on the accompanying map. Except for a slight overlapping of the ranges of *Santalum* and *Eucarya* in South Eastern Australia, the areas occupied by the genera are separate, *Santalum* occurring in Southern India, Eastern Malaya, Australia and Polynesia, *Eucarya* being restricted to Extra-tropical Australia, while *Mida*, which has the most southerly distribution, has one species in New Zealand and a second in Juan Fernandez.

The distribution of *Eucarya* calls for no comment. That of *Mida* (New Zealand-Juan Fernandez) might *prima facie* seem surprising. A number of genera, however, are confined to Temperate South America (especially Chile) and New Zealand, and some of these occur also in Juan Fernandez. It is generally supposed that such genera were formerly inhabitants of the antarctic continent, whence they migrated northwards to New Zealand on the one hand and to South America on the other. It is here suggested that *Mida* represents a special case of this type of distribution, and that it may formerly have existed both in the South Island of New Zealand and on the mainland of South America. On the other hand its near relationship with *Santalum* suggests the possibility of a diphyletic derivation from that genus and of a tropical origin. *M. salicifolia* exhibits tendencies to alternate leaf arrangement, lateral inflorescence and polygamy, none of which appears to be present in *M. fernandeziana*, which in these respects approaches *Santalum*.

The discontinuous distribution attributed to *Santalum album* (absent between India and Eastern Java) might conceivably be due to extirpation by disease in the intervening area, or to the introduction of the species from Eastern Malaya into India.

With regard to the first hypothesis the endemic sandal-wood tree of Juan Fernandez (*Mida fernandeziana*) was formerly very common, but according to Gay (Fl. Chil. v. 326: 1846) in the course of a single year all the trees perished and only dead trunks were to be seen. Although several trees were subsequently discovered of which one survived until the beginning of the present century, it can hardly be doubted that the extinction of *Mida fernandeziana* was due primarily to the above-mentioned epidemic.

In connection with the second hypothesis Mr. C. E. C. Fischer has kindly contributed the following account.



I A. Range of *Santalum album*, I B. Range of remaining species of *Santalum*. II *Eucarya*, III *Mida*.

V. *Santalum album* in India. (By C. E. C. Fischer.)

The natural distribution of *Santalum album* Linn. in India is given as from Nassik in the Bombay Presidency southwards to Madura in the Madras Presidency. As far as I know, the assumption that the species is truly indigenous has never been openly questioned.

When I had to deal with this tree, as a Forest Officer in the Coimbatore District of the Madras Presidency, I came to the conclusion that it is not indigenous in that District, and I doubted that it is indigenous in India at all. My reason was that in Coimbatore, as in the conterminous parts of Mysore, the tree occurs (or occurred in 1905-07) only in the vicinity of existing villages or abandoned village sites, mainly in hedgerows and thickets. As one went further from such centres the sandal thinned out, became rarer and rarer till it disappeared altogether, though all the conditions appeared to be identical. The contrary is what one would expect if the species were truly indigenous, because cattle are exceedingly fond of sandal leaves and are apt to destroy the plants and cattle aggregate around the villages. This also explains why the plants are found almost confined to the thickets and hedgerows, because it is there that they find some protection from the cattle. The fact that though sandal reproduces freely from seed it had not long since spread into all suitable areas impressed me greatly and led me to consider how it could have been introduced and spread so as to cause it to be considered indigenous.

Now for many years, before the British conquered Mysore from Tippoo Sultan, the rulers of that country had exercised a royal prerogative over the sandal-wood tree and had imposed very stringent regulations against its exploitation without proper authority; in fact the tree, wherever it occurred, and whether artificially or naturally grown, was the property of the rulers and not of the occupier of the land, to whom it would be, therefore, a positive nuisance. This fact, together with the observations above, induced me to think that the tree had been introduced in a dim past of which the record is lost (or at least buried and available only to the sanskrit scholar) for the sake of the valuable scented oil of its wood, and was thereafter treated as a "royal tree". Its dispersal might well have been enforced on the subjects of an autocratic ruler in order to ensure a constant and ample supply. Such introduction must have taken place at a very early date, possibly a pre-Christian one, since the use of sandal-wood is encrusted in the religious life of Brahmins and others. After its satisfactory introduction in a suitable locality its further spread would follow by natural processes, for it is a hardy and adaptable tree provided that the soil is not too wet. It will stand considerable mutilation except in early youth, indeed, short of uprooting, it is not easy to kill a sandal tree.

Its spread, however, has been comparatively slow and I cannot

conceive why it should not have occupied all suitable adjoining tracts long since if it is truly indigenous.

According to Garcia and Acosta in their works written in the middle of the 16th Century, the greater quantity of and the best sandal-wood came from Timor and adjacent islands. The latter states that the Chinese, who had a mercantile establishment there, brought sandal-wood from the Malay Islands to Calicut on the west coast of India, from whence it was distributed to all parts. Though admitting that some sandal is grown in India proper (there is, however, some confusion between red or coloured sandal, which is the Red Sanders wood of *Pterocarpus santalinus*, and the white or yellow sandal-wood of *Santalum album*), Acosta does not refer to its being brought to Calicut, and it is no great presumption to think that if it formed part of the sandal-wood trade it was only a very minor factor. Sandal-wood, however, was much prized all over the eastern region not only then but for centuries before, as it was much used medicinally and for scenting the oils used for anointing and cooling the body. Sandal figures in the earliest of the Sanskrit medical works. It is not straining the imagination, therefore, to believe that if sandal did not occur in India but was brought abundantly to Calicut, some one may have had the happy thought of growing the tree in India. That being so, Mysore would be probably the best locality for its introduction and one of the nearest suitable places. Some support is also gained from the statement of Mathiolo Sevensé quoted by Acosta, who states that the coloured sandal grew exclusively on the "hither" side of the Ganges and the white and yellow sandal on the far side. By these terms he can only have meant by the hither side India proper and the far side Burma and Malaya.

In 1800 Francis Buchanan-Hamilton made an extended tour through Mysore, Coimbatore, Malabar and Kanara, and he refers in his reports frequently to the sandal-wood tree, which by then was well established in parts of these territories, which were those of which Tippoo had recently been dispossessed. But even there sandal was restricted, and he states that there was no sandal, or only an insignificant quantity, in Coorg, where now it is plentiful and a source of considerable revenue. Hamilton mentions a plantation of healthy sandal some 20 years old at Waluru near the eastern border of Mysore and not many miles from the Palmaner plateau of the present Chittoar District of the Madras Presidency. About a century later a keen and observant Forest Officer, the late Mr. C. E. Brazier, made an official tour of this plateau and submitted a detailed inspection note with suggestions for future management. He found two or three thriving small sandal plantations which had been made some 30 or 40 years earlier, but he makes no reference whatever to finding sandal growing promiscuously in the surrounding jungle. In 1921 sandal was abundant nearly all over the forests of the plateau of some 200 square miles. It is quite impossible that Mr. Brazier should have overlooked a

plant of such value and with which he was well acquainted had it occurred in any quantity, i.e., even had there been one plant for every hundred that existed in 1921. If sandal could spread so rapidly in some 20 years or so in this locality it is incredible that, were it an indigenous species, it would not have intruded into every suitable locality during the previous centuries.

There is evidence in Hamilton's report that the spread of sandal artificially was encouraged among, if not even forced on, local cultivators and land owners in Mysore, but as they did not benefit thereby but probably found sandal a nuisance, it is not surprising that progress was slow.

Sandal succeeds best at a fair elevation, about 2,000–3,500 feet above sea level, and it is within these limits that the Bangalore plateau lies. Generally speaking, rather dry conditions are ascribed as its preference, but there the tree seldom attains more than 40 feet in height and 30–36 inches in girth, whereas under moister conditions and with a richer soil it will grow to a height of 100 feet with a girth at breast height of 6 feet, the rate of growth being of course, much more rapid. It is alleged that the proportion of scented wood is smaller in such rapidly grown trees, but I am not aware that comparison has been made between trees of the same age. It is only to be expected that the percentage of scented wood should be smaller when the growth is rapid, as it is only the heart wood that is scented, and it is quite probable that with age the proportion of scented wood would be comparable in rapidly grown trees. These facts have a certain importance in the question of the origin of the sandal tree, for if it is indigenous in India it is so in the drier tracts of Mysore, and yet we find it better grown and more vigorous in the damper parts. That is what we would expect if the tree came originally from the Malay Archipelago. It would have been introduced first in the immediate vicinity of the larger towns, e.g., Seringapatam, and these lie in the drier parts of Mysore. It has spread more towards the west, where a moister climate prevails, than into the drier East.

There is ample record of a considerable trade of sandal-wood from Timor and other islands of the Malay Archipelago in the early records of European travellers in the East, and of none or a very inconsiderable proportion from India itself, except in the nature of re-export. That conditions have become entirely reversed at the present time is an exact parallel on a small scale with the trade in Para rubber when comparing the output of the natural forests of South America with that of the plantations of the Malay Peninsula.

Though it cannot be claimed that these observations definitely prove the non-Indian origin of *Santalum album*, it seems to me that they give it a certain amount of definite support.

XXVII.—CONTRIBUTIONS TO THE FLORA OF BURMA:
III.*

Michelia uniflora Dandy [Magnoliaceae]; affinis *M. Lacey* W. W. Sm., sed gemmis pedunculoque cinereo-tomentosis differt.

A large tree; branchlets at first grey-tomentose, finally glabrous; terminal bud grey-tomentose. *Leaves* obovate-oblong, subobtusate at the base, shortly acuminate at the tip, about 14–18 cm. long and 5–7 cm. broad, coriaceous, glabrous, shining above, paler beneath, laxly reticulate on both surfaces; lateral nerves about 15 on each side of the midrib, not very prominent; petiole about 1.5–2 cm. long, glabrous, channelled above; stipules free from the petiole. *Flowers* large, white, fragrant, one to a branchlet, axillary but apparently terminal owing to the pushing aside of the terminal bud; peduncle stout, about 1.5 cm. long, grey-tomentose. *Perianth-segments* about 10, the outer oblanceolate and about 6 cm. long, the inner linear and somewhat smaller. *Stamens* about 20–25 mm. long; connective with a short ligular subobtusate appendage. *Gynaecium* with a grey-tomentellous stalk; carpels about 12, grey-tomentellous at the base, glabrescent above; ovules numerous (more than 12). *Fruit* not seen.

Southern Shan States, Bauzaing (Mawson), Feb., 1888, N. Manders.

“Large flowering tree similar in size and shape to a Mangoe. White flowers with sweet heavy odour.”

Desmos chinensis Lour. var. **siamensis** Williams [Anonaceae]. Known only from Siam.

South Tenasserim. Mayinng, Tenasserim River, sea-level, April, C. E. Parkinson 1382.

Goniothalamus Sawtehhii Fischer [Anonaceae]; affinis *G. Thwaitesii* Hook. f. & T., sed ramulis novis pedicellis florisque fulvo-tomentosis, petalis exterioribus latioribus, interioribus rhomboideo-ovatis, carpellis glabris distincta.

Tree about 20 feet high and 3 feet in girth; branchlets glabrescent, dark-grey; twigs densely fulvous-tomentose, later becoming dark-brown felted. *Leaves* thinly chartaceous when dry, elliptic, minutely pellucid-dotted, acute or acuminate, base rounded or cuneate, 9–19 cm. long, 3–6 cm. wide, fulvous-tomentose on both sides when young, later glabrescent above and fulvous-tomentose on the midrib and nerves beneath, midrib channelled above, prominent below, primary nerves indistinct, 9–11 pairs, anastomosing in loops near the margin; petioles 4–7 mm. long, dark-brown or fulvous-tomentose. *Flowers* solitary from the axils of fallen leaves, 3–4 cm. long; peduncles very short with 2–3 apical, broadly-ovate, acute bracteoles, fulvous-tomentose without, glabrous within; pedicels 1–1.5 cm. long, fulvous-tomentose. *Sepals* shortly united at the base, lobes suborbicular, bluntly cuspidate, fulvous-tomentose.

* Continued from K.B. 1927, p. 94.

Petals flat, unequal, 3 outer broadly ovate or ovate-lanceolate, 3-4 cm. long, 1.5-2 cm. wide, obtusely acuminate, base narrowed into a short, broad claw, slightly keeled exteriorly, densely fulvous- or aureo-tomentose on both sides except inside the claw and a triangular patch above it, which are glabrous and black (when dry), 3 inner cohering by their apices, rhomboid-ovate, about 1.5 cm. long, 0.5-0.8 cm. wide, apex thickened and tapering to a blunt point, base narrowed, hardly clawed, apical portion fulvous- or fuscous-tomentose, glabrous and black at the base except for a triangular decurrent patch in the middle of the dorsal aspect. *Stamens* numerous, about 2 mm. long, nail-shaped, the linear anthers concealed by the flat dome-shaped connective. *Carpels* numerous, subulate, glabrous, about 3 mm. long; ovule 1, basal; style continuous with the ovary and about half as long, subulate, entire. *Fruit* not seen.

South Tenasserim. Kyein chaung, June, Maung Saw Teh per C. E. Parkinson 1380.

Vernacular name: *Ta Mee Pie* (Karen).

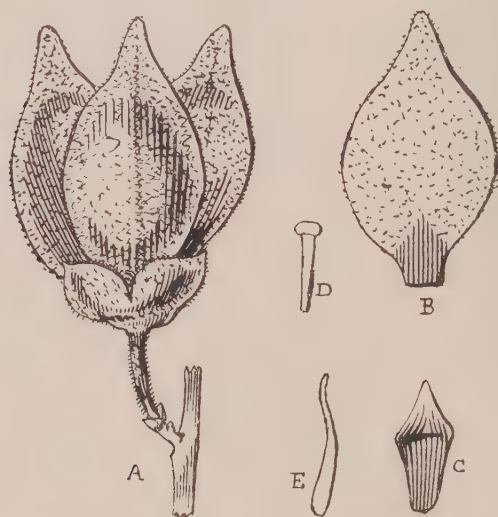


Fig. A. Flower; B. Outer petal; C. Inner petal (all about nat. size); D. Stamen; E. Carpel (both $\times 6$).

***Goniothalamus latestigma* Fischer** [Anonaceae]; affinis *G. tenuifolio* King, sed foliis majoribus, sepalis minoribus pubescentibus ciliatisque, petalis exterioribus basi non constrictis distincta.

Shrub 8-10 feet high; youngest shoots sparsely furnished with appressed reddish-brown hairs. *Leaves* membranous, oblong, abruptly acuminate, 14-27 cm. long, 4-8 cm. wide, minutely pellucid-punctate, glabrous above, with very sparse appressed, dark hairs below, margins minutely crenulate-undulate, midrib channelled

above, prominent below, primary nerves 10-13 pairs, slightly raised below, secondary nerves irregular, reticulations minute; petioles 0.7-1 cm. long, channelled above, appressed-pubescent. *Flowers* solitary, axillary; pedicels about 6 mm. long, rather stout, appressed-pubescent, with 2 supra-basal, lanceolate, hirsute bracts nearly as long as the pedicel. *Sepals* free, thin, ovate-rotund, acute, apiculate, reticulately veined, 1-1.5 cm. long, gland-dotted, appressed-hairy without, glabrous within, strongly ciliate with reddish-brown hairs. *Petals* fleshy, yellowish-green, 3 outer lanceolate, subacute, slightly keeled dorsally, 2.5-3.5 cm. long, rugulose, densely felted with appressed reddish-brown hairs on both sides except for a triangular patch at the base within, 3 inner ovate, subacute, conniving over the stamens and pistils, base concave, apical half thickened, 1-1.5 cm. long, felted with reddish-brown hairs without, greyish pubescent within except the glabrous concave base. *Stamens* numerous, 1.5 mm. long, nail-shaped, anthers concealed by the hemispherical, densely fuscous-villous connective. *Carpels* many. *Ovary* compressed subulate, 1.5-2 mm. long, sparingly reddish-brown hirsute; ovule 1, basal; style very short, stigma as long as or longer than the ovary, curved outwards, funnel-shaped, split down one side, the edges involute (at least when dry), glabrous, apical margin lobulate. *Fruit* not seen.

South Tenasserim. Banlamut, Zawe chaung, about sea-level, March, C. E. Parkinson/1962.

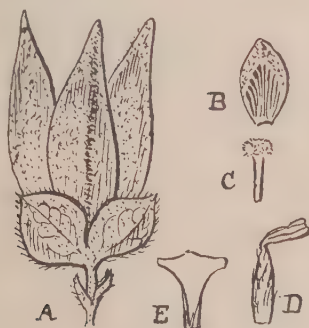


Fig. A. Flower; B. Inner petal, ventral aspect (both about nat. size); C. Stamen; D. Pistil (both $\times 6$); E. Expanded stigma ($\times 12$).

***Cyathocalyx uniflorus* Fischer** [Anonaceae]; affinis *C. virgato* King, sed floribus solitariis, petalis obtusis subequalibus, carpello solitario, toro plano distincta.

Tree 50 feet high; twigs pale-brown, glabrous except the puberulous extremities. *Leaves* rigidly papery, oblong or elliptic-oblong, abruptly acutely acuminate, base acute or cuneate, 6-22 cm. long, 2.5-6.5 cm. wide, glabrous, shining, midrib slightly raised above, prominent below, primary nerves 5-10 pairs, spreading, curved, anastomosing in several loops near the margin, raised below,

secondaries transverse, reticulations fine, distinct. *Petioles* rather stout, shallowly channelled above, 0.6–1.2 cm. long, puberulous. *Flowers* solitary, extra-axillary or leaf-opposed, 2–3 cm. long; pedicels stout, about 5 mm. long, felted with rufous pubescence; bracts caducous. *Sepals* coriaceous, shortly united below, broadly ovate, subacute, 0.8–1 cm. long, felted with rufous pubescence without, fuscous-pubescent within. *Petals* 6, coriaceous, 2-seriate, subequal, valvate, oblong-lanceolate, slightly constricted in the basal third into a broad claw, the inner somewhat concave at the base, apex rounded, 2–2.6 cm. long, felted on both sides with fuscous pubescence except the base which is glabrous and black (at least when dry). *Torus* flat. *Stamens* numerous, narrowly obcuneate, about 2.5 mm. long; anthers concealed by the flat connective. *Carpel* solitary, narrowly conical, truncate, glabrous, rugose, 3–4 mm. long; ovules about 12; stigma hollowed out in the apex of the ovary, puberulous. *Fruit* not seen.

South Tenasserim. Thebyu, Theinkun chaung, June, *Maung Saw Teh* per C. E. Parkinson 1383.

Vernacular name:—*Migyaung-u* (Burmese).

Melodorum Thorellii Pierre [Anonaceae].

Known from Cambodia and Laos.

Mergui. Leikpok chaung, 400 ft., *Mr. Braybon's* collector 2, per C. E. Parkinson.

Some of the leaves are abruptly narrowly cuspidate.

Roydsia suaveolens Roxb. [Capparidaceae].

Known from N.E. India and Cambodia.

South Pegu. Intakaw new reserve, C. E. Parkinson 2562.

Dipterocarpus Kerrii King [Dipterocarpaceae].

Hitherto known only from the Malay Peninsula and possibly Siam.

South Tenasserim. Minthan taung, Tenasserim River, 200 ft., March, C. E. Parkinson 2007.

"A tree 100 feet or more high. Much tapped for oil." (Parkinson).

Vernacular name:—*See-Bin* (Burmese).

The following divergences from the original description were noted in the present specimens:—The leaves are up to 5.5 in. long and 2.6 in. wide and have up to 14 pairs of primary nerves; the petioles attain 1.3 in. long. The wings of the fruit attain a length of 6 in.; the nut is sometimes strongly depressed-globose, up to 1.2 in. across and but 0.6 in. deep.

Hopea Helferi Brandis [Dipterocarpaceae].

South Tenasserim. Thebyu chaung forests, 100 ft., Feb., C. E. Parkinson 1929. "Tree 80–120 ft. high" (Parkinson).

Vernacular name:—*Thingan Kyauk*.

As the fruit was hitherto unknown its description is appended:—*Nut* ovoid, apiculate, 5 mm. long, closely embraced by the 3 unenlarged sepals and the bases of the 2 wings. *Wings* membranous,

narrowly oblong, 5-7 cm. long, 1.2-2 cm. wide, apex rounded, base narrowed into a short claw, 7-nerved, minutely puberulous.

Hopea minutiflora Fischer [Dipterocarpaceae]; affinis *H. odoratae* Roxb., sed foliis subtus puberulis domatiis dense hirsutis munitis, floribus minoribus, sepalis majoribus obtusis, ovarium subglobose, stylo brevissimo, fructus alis oblanceolatis distincta.

Tree 60 feet high; twigs terete, brown, thinly covered with reddish-brown, densely fascicled hairs. *Leaves* lanceolate, gradually tapering to a blunt point, base rounded, inequilateral, 6-13 cm. long, 2.3-4 cm. wide, midrib and the 8-10 pairs of ascending primary nerves prominent below, secondary nerves close, obliquely transverse, indistinct, glabrous above except the puberulous midrib, thinly puberulous below with short fascicled hairs, the lower axils of the nerves with large densely hirsute domatia; petioles 0.8-1.2 cm. long, covered with reddish-brown fascicled hairs. *Inflorescence* of terminal and axillary, paniced, unilateral racemes, usually shorter than the leaves; rhachis and its branches tomentose with greyish fascicled hairs; pedicels shorter than the sepals, stout. *Sepals* grey-felted, the 2 larger oblong, rounded, 2 mm. long, the 3 smaller subacute. *Petals* falcately obovate-oblong, obtuse, about 3 mm. long, grey-pubescent. *Stamens* 10, about 1 mm. long, glabrous; filaments flat, anthers elliptic-oblong, shorter than the filaments, connective produced into an arista about as long as the anther. *Ovary* subglobose, 2 mm. long, pubescent; style very short, glabrous, stigma minutely 3-toothed. *Nut* ovoid, apiculate, about 4 mm. long, closely embraced by the sepals. *Wings* 2, oblanceolate, apex rounded, 3.5-4.7 cm. long, 1.2-1.6 cm. wide, 6-7-nerved, minutely puberulous.

South Tenasserim, Maliwun, Victoria Point, 100 ft., March, C. E. Parkinson 2028.

Vernacular name:—*Mai-ka-kien* (Shan).

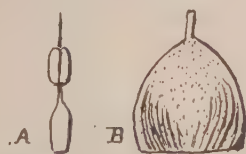


Fig. A. Stamen ($\times 20$); B. Ovary ($\times 10$).

Ancistrocladus extensus Wall. [Ancistrocladaceae].

South Tenasserim, Kanaungyi, Tenasserim River, 200 ft., March, C. E. Parkinson 1976.

The sepals bear 1 or 2 median pitted circular glands on the outer side, when 2 they may be collateral or one a little above the other. They can still be traced in the wings of the fruit. These glands do not appear to have been mentioned in any description, though they seem to be constant and are present in the type specimen in the Wallichian Herbarium. Similar glands are to be seen in other species of the genus.

Brownlowia Helferiana Pierre [Tiliaceae].

South Tenasserim. Banlamut, Zawe chaung, about sea-level, March, C. E. Parkinson 1964.

This species has been represented hitherto in the Kew Herbarium by a single sheet of Helfer's, Kew Distr. No. 624. There is, however, a sheet from Siam without flowers or fruit and with 2 leaves only, which seems to be this species. Pierre's description is very meagre, and so a fuller one is appended:—

A small tree. *Leaves* peltate, broadly ovate or rotund-ovate, acuminate or shortly finely caudate, base rounded, margins subundulate, sometimes with a few broad, apiculate teeth in the apical third, 9–10-ribbed, nerves concentric, ultimate reticulations minute, 20–30 cm. long, of which about one-seventh is below the insertion of the petiole, 14–20 cm. wide, glabrous above, below densely matted with minute greyish, stellate tomentum and more or less hairy, especially on the nerves, with long brownish simple hairs; petiole terete, slightly swollen at either end, glabrescent, 15–25 cm. long. *Inflorescence* terminal, of elongate, paniced cymes up to 30 cm. long; rhachis and its branches densely tomentose with reddish-brown stellate scales. *Flowers* numerous, about 1 cm. diam.; buds subglobose, red; pedicels articulate at the base, 5–7 cm. long, reddish-brown stellate-scaly. *Calyx* cup-shaped, fleshy, 6–7 cm. long, subequally 5-lobed about $\frac{1}{2}$ way down, lobes ovate, subacute, densely felted with reddish-brown stellate scales without, thinly silky within. *Petals* 5, obovate-oblong, rounded, very shortly clawed, glabrous, white, about 1 cm. long. *Torus* about 1 mm. long, slightly angular, glabrous. *Stamens* very many, about 6 mm. long, filaments capillary; anthers small, cells reniform. *Staminodes* linear-ensiform, acuminate, nearly as long as the stamens, standing in the grooves of the ovary. *Ovary* depressed globose, about 2 mm. long, deeply 5-ridged, ridges rounded, striate, densely brown-villous, 5-celled; ovules 2, superposed, compressed ellipsoid, naked; styles subulate, cohering, usually bent over at the apex, covered in the lower third with stellate brown scales, glabrous above, about 5 mm. long. *Fruit* not seen.

Dysoxylum turbinatum King [Meliaceae].

Known only from the Malay Peninsula.

South Tenasserim. Mayinng, Tenasserim River, about 200 ft., March, C. E. Parkinson 1994.

In Mr. Parkinson's specimens the midrib of the leaves on both sides and the nerves below are more permanently hairy than is described by King or Ridley; the disk is 8-lobulate and densely pilose throughout within.

Amoora cucullata Roxb. [Meliaceae].

South Tenasserim. Mayinng, Tenasserim River, at sea-level, March, C. E. Parkinson 2005. "A tree 40–50 feet high of mangrove swamps. Juice milky. Flowers yellow. Has long, sharply-pointed pneumatophores." (Parkinson).

Milky juice and pneumatophores do not appear to have been recorded previously for this species.

Vernacular name:—*Myauk-Leseik* (Burmese).

***Parkia streptocarpa* Hance** [Mimosaceae].

Known only from Siam.

South Tenasserim. Chaungnaukpyan, 300 ft.; Jan., C. E. Parkinson 1642.

***Barringtonia reticulata* Miq.** [Lecithydaceae].

Known from the Philippines and Borneo.

South Tenasserim. Kyein chaung forests, 200 ft., Feb., C. E. Parkinson 1668.

This species does not appear to me to be conspecific with *B. acutangula* Gaertn. as suggested by Merrill; it differs by the more acuminate leaves with more numerous primary nerves (12 or more against 8-9), finer and more open reticulation, longer spikes with larger flowers with different in lumentum and the sepals ciliate.

***Gaertnera lasianthoides* Fischer** [Loganiaceae]; affinis *G. phanerophlebiae* Baker, foliis majoribus ad basim sensim angustatis, stipulis non membranaceis nec vaginantibus laciniatis, floribus minoribus differt.

Shrub 3-4 ft. high; twigs flattened, rufous-hirsute. *Leaves* membranous, oblanceolate, acute, base tapering into the petiole, margins entire, slightly revolute, 12-18 cm. long, 4-6.5 cm. wide, glabrous above, laxly rufous-hairy below, more densely on the midrib and the nerves, midrib prominent below, primary nerves 10-13 pairs, prominent below, regular, ascending, arched, secondary nerves and very fine reticulations slightly raised below but obscure; petioles 0.8-1.5 cm. long, densely rufous-hirsute; stipules 2, oblong, apex more or less lacinate with 2 or more filiform aristae, about 1 cm. long, 0.75 cm. wide, hirsute without and ciliate with rufous hairs, glabrous within. *Flowers* in terminal, panicked, trichotomous cymes much shorter than the leaves, sessile and aggregated at the ends of the cyme-branches; peduncles, rhachises and cyme-branches densely rufous-hirsute; bracts at the forks united in pairs, oblong, 3-toothed at the apex, the middle tooth acuminate, much longer than the lateral, densely rufous-hirsute without, glabrous within; bracteoles simple, lanceolate, acuminate, entire or like the bracts and similarly hirsute. *Calyx* tubular-campanulate, 5-lobed about $\frac{1}{2}$ the way down, about 4 mm. long, rufous-hirsute without, glabrous within, lobes ovate, subacute. *Corolla* hypocrateriform, pale-mauve to white, hirsute with grey and rufous hairs without, glabrous within, tube cylindric, about 4 mm. long, lobes a little shorter, ovate, acute. *Anthers* sessile on the mouth of the corolla-tube, partly exserted, linear-oblong. *Ovary* discoid, small, apex flat, glabrous, 2-celled; ovule solitary in each cell, basal erect, obovoid, compressed; style filiform, glabrous, about as long as the corolla-tube, apex 2-lobed. *Fruit* not seen.

South Tenasserim, Ngawun chaung, 200 ft., Jan., C. E. Parkinson 1607.

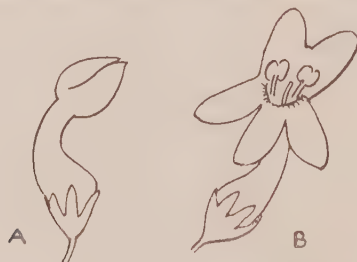
Gymnostachyum trilobum Ridley [Acanthaceae].

Known only from Siam.

South Tenasserim. Kyein chaung, 200 ft., Feb., C. E. Parkinson 1673.

Sphinctacanthus Parkinsonii Fischer [Acanthaceae]; affinis *S. siamensi* C. B. Clarke, foliis et floribus majoribus, spicis longe pedunculatis, lobis corollae obtusis differt.

A small *shrub*; twigs with thin, pale, shining (at least when dry), outer cortex, black within. *Leaves* thinly membranous, narrow-elliptic to oblanceolate, acute or acuminate, base narrowed into the petiole, 12-22 cm. long 3.5-9 cm. wide, quite glabrous, with numerous minute linear cystoliths, margins subundulate, midrib very broad, not raised, dark, primary nerves 8-13 pairs, regular, arching, anastomosing well within the margin, reticulations obscure; petioles 1.5-2.2 cm. long, dark, glabrous, lineolate. *Inflorescence* a terminal, many-flowered spike, 15 cm. long; peduncle 4-5 cm. long peduncle and rhachis dark, minutely puberulous; bracts minute. *Flowers* pedicelled in opposite fascicles of 3 at each node, fascicles sometimes very shortly peduncled. Pedicels slender,



Sphinctacanthus Parkinsonii Fischer.

A. bud; B. open flower (both about nat. size),

3-6 mm. long, minutely puberulous, with a few scattered, stipitate glands. *Calyx* 4 mm. long, 5-lobed for $\frac{2}{3}$ of its length, minutely puberulous without, lobes linear-lanceolate acute or subacute, equal or the anterior shorter. *Corolla* glabrous, 1.8-2 cm. long, mauve, tube curved, swollen at the base, constricted above and narrowed to the mouth, limb 2-lipped, 8-9 mm. long, ovate and imbricate in bud, spreading in flower, upper lip 2-lobed for about $\frac{1}{3}$ its length, lobes oblong, rounded, lower lip deeply 3-lobed, lobes narrower, rounded. *Stamens* 2 perfect, on the mouth of the corollatube, exserted, the base of each united by a narrow ligament to a short, ligulate staminode; filaments flat, broad, glabrous, about 2 mm. long; anthers 2-celled, cells separate, suborbicular or reniform, one slightly below the other, muticous. *Disk* annular, short. *Ovary* ellipsoid, glabrous, 3 mm. long; ovules 4, rotund-ovoid,

compressed, acute, glabrous; style filiform, glabrous shortly exserted; stigma minutely 2-lobed. *Fruit* not seen.

Mytkyina District, Nawraw chaung, Dec., C. E. Parkinson 390.

***Justicia valida* Ridl. var. *glandulosa* Fischer** [Acanthaceae]; a typo rhachidibus bracteae pedicellis calicibusque externe glanduloso-pubescentibus differt.

A branched *shrub* 3-6 ft. high; twigs subquadrangular in section, brown, glabrous. *Leaves* herbaceous, oblanceolate, acutely or bluntly acuminate, base gradually narrowed into the petiole, glabrous, lineate with minute, linear cystoliths, 9-29 cm. long, 3.5-10 cm. wide, margins more or less undulate crenate, midrib rather broad, slightly raised on both faces, shallowly channelled above, primary nerves about 7 pairs, rather broad, pale, regular, arched, anastomosing in several loops near the margin, reticulations obscure; petioles flattened, striate, glabrous 1.5-4.5 cm. long. *Inflorescence* in terminal, very shortly peduncled spikes or racemes, often with a pair of much reduced leaves at the base; rhachis minutely glandular-puberulous; bracts opposite, lanceolate, acuminate, 1-4 mm. long, minutely glandular-puberulous. *Flowers* very shortly pedicelled, 1-2 cm. long, bracteoles like the bracts. *Calyx* about 4 mm. long, 5-partite almost to the base, minutely glandular-puberulous without and glandular-ciliate, minutely pubescent within, lobes linear-lanceolate, acute. *Corolla* 1 cm. long, tubular-ventricose, 2-lipped, greenish dotted with purple, lower lip white, whitish-pubescent without, minutely hairy inside the tube, tube 6 mm. long, rather broad, slightly ventricose at the base, upper lip oblong, shortly 2-lobed, lobes rounded, lower lip 3-lobed for $\frac{1}{2}$ its length, mid lobe triangular-ovate, acute, lateral lanceolate, acute. *Stamens* 2; filaments free from about the middle of the corolla-tube, filiform-subulate, shortly white-hairy below, glabrous above; anthers exserted, elliptic, white-hairy on the back, 2-celled, cells separated, one a little above the other with empty, minutely spurred bases. *Disk* short, annular, sparsely, minutely ciliate. *Ovary* ellipsoid, 2-3 mm. long, glabrous except the sparsely hairy tip; ovules 4, suborbicular, glabrous; style filiform, furnished with ascending hairs on the lower half, glabrous above, slightly exserted; stigma minutely 2-lobed. *Capsule* clavate with a solid cylindric base, minutely puberulous. *Seeds* 2, supported by upturned, hard retinacula, flat, suborbicular or cordate, 4-5 mm. long, brown, papillose-rugose.

South Tenasserim, Theinkun chaung, Naunghwa, 200 ft., Feb., C. E. Parkinson 1696 (type). Also in Herb. Kew., Siam, Nam Rat, 100 m., October, *Vanpruk* 690.

***Glochidion subterblancum* Fischer** [Euphorbiaceae]; sectioni *Glochidiopsi* congruit sed a specibus aliis sepalis aequalibus latis, foliis infra albis differt.

A small *shrub*; branchlets terete, glabrous, brown. Twigs slightly flattened, often 2-keeled by the decurrent petioles, glabrous,

pale-brown. *Leaves* bifarious, broadly ovate, obtuse or subacute, base rounded and sometimes shortly, abruptly acute, 4-6.5 cm. long, 2.5-4 cm. wide, quite glabrous, creamy-white below, midrib slightly raised above, primary nerves 6 pairs, arching and uniting by a single loop near the margin, distinct above, obscure below, reticulations obscure, margins very slightly revolute; petioles terete, glabrous, 2-3 mm. long; stipules short, ovate or lanceolate, acute or acuminate, glabrous. *Inflorescence* of a few flowers fascicled on axillary, multibracteate branchlets 2-5 mm. long. *Flowers* ♂ about 4 mm. in diam.; pedicels 2-3 mm. long. *Perianth* spreading, 6-lobed for about half its length, lobes broad, basal angles rounded and overlapping, apex rounded or cuspidate, pale-green. *Stamens* 3, united into a central column; anthers erect, as long as the column, obovate. *Pistillode* 0. *Flowers* ♀ 0.9-1 cm. in diam.; pedicels stouter than of the ♂. *Perianth* as in the ♂ but less cuspidate, more often truncate or emarginate. *Ovary* pyramidal-discoid, 6-lobed, 3-celled; ovules 2 in each cell, collateral; styles 3, quite free, bifid for about $\frac{1}{2}$ their length, the 2 segments subulate. *Fruit* not seen.

South Tenasserim, Kyein chaung, 200 ft., Feb., *C. E. Parkinson* 1669.

Vernacular names: *Kyanna* (Burmese); *Thakwan* (Shan).

Tacca Chantièri André [Taccaceae] (= *T. Garretti* Craib).

Known from Malaya and Siam.

South Tenasserim. Htape chaung, 300 ft., Jan., *C. E. Parkinson* 1619.

XXVIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXII.

Oberonia apiculata Kerr [Orchidaceae—Epidendreae]; affinis *O. demissae* Lindl., sed labelli lobo mediano rotundato et apiculato recedit.

Herba epiphytica, acaulis, 4-5-foliatâ. *Folia* late ensiformia, interdum leviter falcata, minutissime apiculata, ad 2.5 cm. longa et 0.8 cm. lata, carnosula. *Inflorescentia* 3.8-5 cm. longa, decurvata; pedunculus 1.3-1.6 cm. longus, paucibracteatus; racemus 2.5-3.5 cm. longus, perdense multiflorus; bracteae late triangulares, 2.5 mm. longae, 2.5 mm. latae, subdentatae; pedicellus cum ovario 1.5 mm. longus, crassus; flores expansi 3 mm. diametro. *Sepalum intermedium* late ovatum, obtusum, 2 mm. longum, 1.2 mm. latum; sepala lateralia late falcata, obtusa, 1.3 mm. longa, 1.2 mm. lata. *Petala* elliptica, obtusa, 1.75 mm. longa, 0.75 mm. lata, margine paucidentata. *Labellum* 1.5 mm. longum, 1.75 mm. latum, trilobatum; lobi laterales rotundati, margine dentati; lobe intermedius triangularis vel

* Continued from *K.B.*, 1927, p. 174.

suborbiculatus, apiculatus, margine integer; discus concavus. *Columna* perbrevis, crassiuscula.

Krabin, under 50 m., on trees in open deciduous forest, *Kerr* 0208.

Oberonia betongensis *Kerr* [Orchidaceae—Epidendreae]; species ad *O. miniatam* Lindl., accedit sed labello latiore, floribus subverticillatis differt.

Herba epiphytica, caespitosa; caules erecti, ad 9 cm. alti. *Folia* cultriformia, acuta, ad 2.5 cm. longa, 0.7 cm. lata, carnosula. *Racemus* ad 19 cm. longus, usque supra basem floriferus, multiflorus, floribus subverticillatis, rhachi tomento albedo lepidoto vestito; bracteae ovatae, acuminatae, 2 mm. longae, dense tomentosae; pedicellus cum ovario 0.5 mm. longus, dense tomentosus. *Sepala* inter se subaequalia, late ovata, obtusa, 0.75 mm. longa, 0.5 mm. lata, extus tenuiter tomentosa. *Petala* lanceolata, 0.7 mm. longa, 0.4 mm. lata, minute denticulata. *Labellum* obcordatum, e basi gradatim dilatatum, 1 mm. longum, 0.7 mm. latum, apice bilobatum et obscure denticulatum. *Columna* brevis, crassiuscula.

Pattani, Betong, 400 m., on trees in evergreen forest, *Kerr* 093.

Kerr 072 also from Betong, but in young bud only, may be this species.

Oberonia bambusicola *Kerr* [Orchidaceae—Epidendreae]; affinis *O. recurvae* Lindl., sed labello pro rata brevior, petalis minus erosis differt.

Herba epiphytica, acaulis, 6-7-foliata. *Folia* lineari-oblonga, recta vel subfalcata, acuta, ad 6 cm. longa, 0.6 cm. lata. *Inflorescentia* ad 10 cm. longa, pedunculo communi dense bracteato ad 3.5 cm. longo incluso; racemus dense multiflorus, floribus subverticillatis; bracteae anguste triangulatae, acutae, 3 mm. longae, 1 mm. latae, irregulariter erosae; pedicellus cum ovario 1.5 mm. longus, tenuis. *Sepala* inter se subaequalia, late ovata, obtusa, 1.5 mm. longa, 1.3 mm. lata. *Petala* obovata, obtusa, 1.5 mm. longa, 0.8 mm. lata, subdentata. *Labellum* subquadratum, 2 mm. longum, 2.2 mm. latum, lobis lateralibus magnis rotundatis dentatis, lobo intermedio obcordato cum apiculo minuto in sinum interiecto. *Columna* brevis, crassiuscula.

Sriracha, Nawng Kaw, 50 m., on bamboos in evergreen forest, flowers greenish-brown, *Kerr* 383.

Oberonia quinquelobata *Kerr* [Orchidaceae—Epidendreae]; affinis *O. myrianthae* Lindl., sed labello lobis quinque subaequalibus facile distinguenda.

Herba epiphytica, acaulis, 3-5-foliata. *Folia* ensiformia, interdum leviter falcata, acuta, ad 7.5 cm. longa, 0.6 cm. lata. *Inflorescentia* ad 20 cm. longa, pedunculo communi bracteis acutis disseminato incluso; racemus ad 18 cm. longus, floribus subverticillatis; bracteae triangulatae, acutae, 3.5 mm. longae, 1 mm. latae, membranaceae, marginibus profunde et irregulariter laceratae; pedicellus cum ovario 1 mm. longus. *Sepalum* inter-

medium ovatum, obtusum, 1.5 mm. longum, 0.75 mm. latum; sepala lateralia late falcata, obtusa, 1.5 mm. longa, 1 mm. lata. *Petala* ovata, obtusa, 1.5 mm. longa, 0.5 mm. lata, integra. *Labellum* subquadratum, 1.5 mm. longum, 1.5 mm. latum, quinquelobatum; lobi laterales parvi, rotundati, erecti; lobus intermedius tribus lobulis subaequalibus, margine haud dentatus. *Columna* brevis, ampla, patulo clinandrio.

Chiengmai, Kawng Hê, 900 m., *Lung Yi* 0228 in Herb. *Kerr*.

Oberonia teres *Kerr* [Orchidaceae—Epidendreae]; species *O. Myosuro* Lindl., similis, sed labelli lobo intermedio haud caudato facile distinguenda.

Herba epiphytica, subacaulis, caespitosa, 3-7-foliata. *Folia* recurvata vel recta, teretia, haud sulcata, ad 2.5 cm. longa, 0.2 cm. diametro. *Inflorescentia* ad 2.8 cm. longa (pedunculo communi ad 1 cm. longo multibracteato incluso), perdense multiflora; bracteae oblongae, obtusae, 1.7 mm. longae, 0.7 mm. latae, apice irregularidentatae. *Sepala* subaequalia, ovata, concava, obtusa, 1 mm. longa, 0.7 mm. lata. *Petala* linearia, 0.8 mm. longa, 0.2 mm. lata, versus apicem subdentata. *Labellum* suborbiculatum, 1.2 mm. diametro; lobi laterales parvi, auriculiformes; lobus intermedius rotundatus, apice bilobulatus, cum apiculo interjecto, margine leviter dentatus. *Columna* crassiuscula, clinandrio antheram arcte attingente.

Chiengmai, Mê Tun, 800 m., on trees in open forest, *Kerr* 484.

Oberonia variabilis *Kerr* [Orchidaceae—Epidendreae]; ab *O. intermedia* King et Pantling, labello lobo intermedio haud eroso, petalis pro rata latioribus recedit.

Herba epiphytica, caespitosa; caulis ad 2 cm. longus, 3-5-foliatus. *Folia* ensiformia, interdum leviter falcata, acuta, ad 2.4 cm. longa, 0.4 cm. lata. *Inflorescentia* ad 10 cm. longa; pedunculus communis ad 2.5 cm. longus, gracilis, multibracteatus; racemus ad 7.5 cm. longus, dense multiflorus, floribus subverticillatis; bracteae ad 1.5 mm. longae, 0.7 mm. latae, margine leviter undulatae; pedicellus cum ovario 1 mm. longus. *Sepalum intermedium* ovatum, obtusum, 0.7 mm. longum, 0.4 mm. latum; sepala lateralia obtusa, late falcata, 0.7 mm. longa, 0.5 mm. lata. *Petala* ovata, obtusa, 0.7 mm. longa, 0.5 mm. lata, integerrima. *Labellum* 0.8 mm. longum, 0.8 mm. latum, 3-lobatum; lobi laterales angusti, leviter falcati; lobus intermedius rotundatus, interdum apiculatus. *Columna* crassiuscula, amplo clinandrio.

Chiengmai, Kawng Hê, 960 m., common on tea trees, flowers reddish, *Local Collector* 369 in Herb. *Kerr*.

Oberonia variabilis *Kerr*, var. **trilobulata** *Kerr* [Orchidaceae—Epidendreae]; a typo labelli lobo intermedio apice trilobulato recedit.

Chiengmai, Kawng Hê, 960 m., on tea trees, flowers reddish, *Local Collector* 369a in Herb. *Kerr*.

Liparis angkae Kerr [Orchidaceae—Epidendreae]; a *L. nepalense* Lindl., labello pro rata latiore, acumine breviori inter alia recedit.

Herba terrestris; rhizoma breve, circiter 0.4 cm. diametro; pseudobulbus ovoideus, ad 1.5 cm. altus, basi 0.8 cm. diametro, 2-foliatus. *Folia* late ovata, obtuse acuminata, basi cordata, 5-8.5 cm. longa, 3.5-5.5 cm. lata; folium inferius petiolo ad 3 cm. longo suffultum, superius sessile. *Inflorescentia* ad 14 cm. longa; pedunculus communis ad 8 cm. longus, dimidio superiore dense bracteatus; racemus ad 6 cm. longus, multiflorus; bracteae oblongae, obtusae, ad 5 mm. longae, 1.5 mm. latae, 1-nervatae; pedicellus cum ovario 7 mm. longus. *Sepalum intermedium* oblongo-ovatum, obtusum, 7.5 mm. longum, 2 mm. latum, integerrimum, 3-nervatum; sepala lateralia oblongo-ovata, leviter inaequilaterialia, obtusa, 7.5 mm. longa, 2 mm. lata, 3-nervata, subter labellum incumbentia. *Petala* linearia, 7.5 mm. longa, 0.7 mm. lata, 1-nervata, deflexa. *Labellum* ovatum, breviter acuminatum, 9 mm. longum, 5 mm. latum, basi callis triangularibus duobus. *Columna* 2.5 mm. longa, valde curvata, haud alata.

Doi Angka, Pa Ngem, 2100 m., on mossy open rocks, sepals green, petals red, lip green with red veins, *Kerr* 497.

Liparis Craibiana Kerr [Orchidaceae—Epidendreae]; affinis *L. stenoglossae* Par. et Reichb. f., sed habitu robustiore labello angustiore differt.

Herba terrestris; pseudobulbus ovatus, circiter 3 cm. altus, basi 1 cm. diametro, plerumque 4-foliatus. *Folia* laminis late ellipticis vel ovato-ellipticis basi sensim angustatis usque ad 18 cm. longis et 7.5 cm. latis, petiolis 2-4 cm. longis suffulta. *Inflorescentia* ad 19 cm. longa; pedunculus communis ad 14 cm. longus, 1-2-bracteatus; racemus ad 5 cm. longus, 8-12-florus; bracteae late ovatae, longe acuminatae, 3 mm. longae, 1 mm. latae; pedicellus cum ovario 8 mm. longus; ovarium alis crenulatis sex. *Sepala* oblonga, obtusa, subaequalia, 7.5 mm. longa, 1.5 mm. lata, 5-nervata; lateralia leviter falcata. *Petala* linearia, obtusa, 7 mm. longa, 0.5 mm. lata. *Labellum* liguliforme, 6 mm. longum, 2 mm. latum, basi callis duobus curvatis cornuformibus instructum, apice obscure trilobatum, supra partem basalem leviter constrictum. *Columna* 3 mm. longa, arcuata, apice breviter biauriculata.

Doi Suteh, 750 m., on rock in evergreen forest, flowers green, *Kerr* 349.

Liparis fimbriata Kerr [Orchidaceae—Epidendreae]; affinis *L. barbatae* Lindl., a qua floribus maioribus et labello valde fimbriato recedit.

Herba terrestris; caulis 5-9 cm. longus, inferne leviter tumidus, 2-3-foliatus. *Folia* late elliptica vel ovata, leviter acuminata, ad 10 cm. longa, 4.5 cm. lata, petiolo ad 1.5 cm. longo suffulta. *Inflorescentia* ad 9 cm. longa; pedunculus communis ad 5 cm. longus, paucibracteatus; racemus ad 4 cm. longus, pauciflorus; bracteae triangulares, 1.5 mm. longae, 1 mm. latae; pedicellus cum

ovario 8 mm. longus. *Sepalum intermedium* lineare, obtusum, 7 mm. longum, 1 mm. latum, 3-nervatum; sepala lateralalia 5 mm. longa, 1.7 mm. lata, leviter falcata, 3-nervata. *Petala* linearia, obtusa, 6 mm. longa, 0.9 mm. lata, 1-nervata. *Labellum* oblongo-cuneatum, bilobatum, 6 mm. longum, 3 mm. latum, basi callis parvis duobus, lobis terminalibus rotundatis breviter fimbriatis.

Doi Sutep, 580-660 m., by stream in evergreen forest, *Kerr* 351 (type), 351a. Flowers pale green with a double purple streak along disc.

***Liparis odorata* Lindl., var. *intacta* Kerr** [Orchidaceae—Epidendreae]; a typa floribus minoribus, labelli margine haud denticulato et bracteis plerumque deflexis recedit.

Chiangmai, Mè Tun, 1000 m., open grassy forest, *Kerr* 0235.

***Liparis paludigena* Kerr** [Orchidaceae—Epidendreae]; species *L. deflexae* Hook. f., affinis sed labelli callo bilobato et columna distincte alata differt.

Herba terrestris; caulis ad 10 cm. longus, basi circiter 1.3 cm. diametro, superne paulatim decrescens, 3-4-foliatus. *Folia* late elliptica, acuminata, basi inaequilateralalia, ad 20 cm. longa, 10 cm. lata, nervis septem prominentibus; folium inferius petiolo 3.5 cm. longo suffultum; folia superiora sessilia vel subsessilia. *Inflorescentia* ad 35 cm. longa; pedunculus communis ad 19 cm. longus, costatus, 2-3-bracteatus; racemus ad 16 cm. longus, multiflorus; bractee lineares, acutae, 8.5 mm. longae, 1 mm. latae, deflexae; pedicellus cum ovario ad 1.2 cm. longus, gracilis. *Sepalum intermedium* oblongum, obtusum, 6 mm. longum, 1.5 mm. latum; sepala lateralalia late falcata, obtusa, 4.5 mm. longa, 2 mm. lata, 3-nervata. *Petala* falcato-oblonga, obtusa, 5.5 mm. longa, 1.25 mm. lata. *Labellum* obovatum, 4 mm. longum, 3.75 mm. latum, basi callo bilobato et auriculis parvulis columnam complectentibus instructum. *Columna* 3 mm. longa, iuxta stigma alis triangulis parvulis instructa.

Pattani, Bachaw, 600 m., on damp ground by stream in evergreen forest, column green, perianth purple, *Kerr* 036.

***Liparis pusilla* Ridley, var. *breviscapa* Kerr** [Orchidaceae—Epidendreae]; inflorescentia foliis brevior, columna brevior et robustiore distinguenda.

Pattani, Kao Kalakiri, 500 m., on trees in evergreen forest, flowers pale green, *Kerr* 0105.

***Liparis saltucola* Kerr** [Orchidaceae—Epidendreae]; affinis *L. striatae* Par. et Reichb. f., sed labello mucronato haud denticulato et basi callo bicorni differt.

Herba epiphytica; pseudobulbus teres, gracilis, ad 9 cm. longus, 0.3 cm. diametro, basi vaginis vestitus, 2-foliatus. *Folia* lanceolata vel oblanceolata, acuta vel obtusa, ad 8.5 cm. longa, 2.3 cm. lata, subsessilia. *Inflorescentia* ad 19 cm. longa; pedunculus communis ad 5 cm. longus, 1-2-bracteatus; racemus ad 14 cm. longus, multiflorus; bractee triangulares, 4 mm. longae, 1.5 mm.

latae, 1-nervatae; pedicellus cum ovario ad 8 mm. longus. *Sepalum intermedium* oblongo-lanceolatum, subacutum, 5.5 mm. longum, 1.5 mm. latum, margine revolutum, 3-nervatum; sepala lateralialia leviter falcata, 6 mm. longa, 2 mm. lata, aliter sepalo intermedio similia. *Petala* linearialia, 5 mm. longa, 0.6 mm. lata, 1-nervata. *Labellum* panduriforme, apice rotundatum, mucronatum, 6 mm. longum, 3 mm. latum, basi callo bicornae. *Columna* 2.5 mm. longa, arcuata, superne alis oblongis instructa.

Chiangmai, Mê Chêm, 1400 m., on tree in evergreen forest, Kerr 491.

***Dendrobium confinale* Kerr** [Orchidaceae—Epidendreae]; affine *D. eriifloro* Griff., sed labello margine brevius dentato et columna puberula differt.

Herba epiphytica; caules ad 7 cm. longi, aggregati, e basi crassiore sensim attenuati, vaginis amplis imbricatis vestiti. *Folia* deficientia. *Inflorescentia* ad 3.5 cm. longa, terminalis et lateralis; pedunculus communis ad 1.5 cm. longus, vaginis 2-3 instructus; racemus ad 2 cm. longus, 4-7-florus; bracteae ovato-oblongae, acutae, 2.5 mm. longae, 0.75 mm. latae; pedicellus cum ovario 5 mm. longus, gracilis. *Sepalum intermedium* ovato-oblongum, leviter carinatum, acutum, 7 mm. longum, 2 mm. latum, 5-nervatum; sepala lateralialia falcato-triangularia, leviter carinata, minute mucronata, 6.5 mm. longa, 2.5 mm. lata, 5-nervata. *Petala* oblongo-obovata, 6.5 mm. longa, 1.5 mm. lata, 3-nervata. *Labellum* ovatum, 6.5 mm. longum, 5 mm. latum, haud lobatum, margine leviter dentatum, iuxta apicem crispatum, lineis tribus elevatis in disco e basi orientibus et 2 mm. ab apice terminantibus; mentum 6 mm. longum, apice rotundatum et sursum curvatum. *Columna* 2.5 mm. longa, minute puberula, margine leviter ciliata.

Krat, Baw Rai, near Siam-Cambodia boundary, 400 m., on trees in evergreen forest, sepals and petals white, lip white, closely veined with purple, Kerr 0218.

***Dendrobium kratense* Kerr** [Orchidaceae—Epidendreae]; species *D. incurvo* Lindl., similis sed floribus maioribus, mento longiore, et sepalis petalisque pro rata angustioribus differt.

Herba epiphytica; caules aggregati, teretes, ad 16 cm. longi, 0.4 cm. diametro, internodiis ad 1.5 cm. longis, superne 4-6-foliati, inferne vaginis 2-3 obtekti. *Folia* lineari-lanceolata vel lineari-oblonga, oblique biapiculata, ad 6 cm. longa, 1 cm. lata. *Inflorescentia* ad 3 cm. longa, lateralis et terminalis, foliis brevior; pedunculus communis ad 1.5 cm. longus, 3-vaginatus; racemus ad 1.5 cm. longus, 2-9-florus; bracteae ellipticae, apice breviter acuminatae, 4.5 mm. longae, 1.5 mm. latae; pedicellus cum ovario 5.5 mm. longus. *Sepalum intermedium* lineari-oblongum, acutum, 10 mm. longum, 1.5 mm. latum, apice margine involutum, 3-nervatum; sepala lateralialia leviter falcata, acuta, 9 mm. longa, 2 mm. lata, apice margine involuta, 3-nervata. *Petala* lineari-oblonga, acuta, 9 mm. longa, 1.5 mm. lata, basi 3-nervata,

deinde 1-nervata. *Labellum* supra apicem menti oriens, elliptico-ovatum, acutum, 9 mm. longum, 4.5 mm. latum, haud lobatum, iuxta apicem margine valde crispatum, lineis tribus vix elevatulis in disco; mentum circiter 5.5 mm. longum, fere rectum, gracile, sensim attenuatum ad apicem rotundatum. *Columna* 1.5 mm. longa.

Krat, Kao Saming, under 20 m., on small tree in open glade, flowers fragrant, sepals and petals white, lip greenish-white with green veins, *Kerr* 0193.

Dendrobium Ridleyanum *Kerr* [Orchidaceae—Epidendreae]; species ad gregem *D. crumenati* Sw., pertinens sed epichilio quadrato mobile facile distinguenda.

Herba epiphytica; caules aggregati, ad 60 cm. longi, basi 2–3 cm. (2–3 internodiis) teretes, deinde 4–8 cm. (2–3 internodiis) fusiformi-incrassati, valde sulcati, superne graciles, leviter compressi, foliosi. *Folia* sessilia, oblonga, apice inaequaliter bilobata, ad 6 cm. longa, 1 cm. lata, vaginis 1.5–2.5 cm. longis. *Flores* in parte superiore defoliata caulis succedanei e bracteis glomeratis orientes; bracteae 6 mm. longae; pedicellus cum ovario 7 mm. longus. *Sepalum intermedium* ovato-oblongum, obtusum, 1 cm. longum, 0.35 cm. latum; sepala lateralialia late falcata, 1 cm. longa, 0.6 cm. lata. *Mentum* late conicum, obtusum, circiter 1.2 cm. longum, rectum. *Petala* lanceolata, acuta, 1 cm. longa, 0.25 cm. lata. *Labellum* 1.5 cm. longum; hypochilium 1 cm. longum, 1.1 cm. latum, lobis lateralibus magnis rotundatis, in disco 3 lineis elevatis in cristam villosam iuxta coniunctionem epichilii terminantibus; epichilium quadratum, emarginatum, 0.5 cm. longum, 0.7 cm. latum, irregulariter dentatum, in hypochilio per cardinem angustum affixum. *Columna* 0.3 cm. longa, stelidiis late triangularibus recurvis.

Pattani, Betong, 200 m., on tree by stream in evergreen forest, flowers white, tinted pink, with a pale yellow patch on lip, *Kerr* 0102.

Bulbophyllum bractescens *Rolfe* mss. descr. *Kerr* [Orchidaceae—Epidendreae]; inter species *B. cupreo* Lindl., affines bracteis amplioribus flores omnino oculentibus facile distinguendum.

Herba epiphytica; rhizoma teres, robustum, circiter 0.3 cm. diametro, pseudobulbos 3–6 cm. inter se remotos ferens; pseudobulbus ovatus, ad 2 cm. altus, basi 1.5 cm. diametro, unifolius. *Folia* oblongo-lanceolata, obtusa, leviter bilobata, ad 12 cm. longa, 2.2 cm. lata, basi in petiolum 1.3 cm. longum sensim attenuata. *Inflorescentia* e basi pseudobulbi juvenilis oriens, ad 8 cm. longa, decurvata; pedunculus communis ad 4 cm. longus, bracteis amplis laxis ad 2.8 cm. longis et 1.7 cm. latis obtectus; racemus circiter 4 cm. longus; bracteae oblongae, obtusae, 2.4 cm. longae, 0.5 cm. latae, 5-nervatae, flores multum superantes; pedicellus cum ovario 2.5 mm. longus, curvatus. *Sepalum intermedium* ovato-oblongum, apice truncatum, minute mucronatum, 5.5 mm. longum, 2 mm.

latum, 5-nervatum; sepala lateralialia ovato-lanceolata, acuminata, 6 mm. longa, 3 mm. lata, apicibus connatis. *Petala* obovata, acuminata, 2.5 mm. longa, 1.5 mm. lata, integerrima, 1-nervata. *Labellum* longe triangulare, 2.5 mm. longum, 0.5 mm. latum, margine minute denticulatum, basi auriculis acutis recurvatis. *Columna* 2.5 mm. longa, robusta, stelidiis 0.5 mm. longis acutis recurvis; pes columnae ultra originem sepalorum lateralium leviter productus.

Doi Suteh, 1000-1650 m., very common on trees in evergreen forest, *Kerr* 192.

Bulbophyllum Craibianum *Kerr* [Orchidaceae—Epidendreae]; affinis *B. leptantho* Hook. f., sed foliis pro rata latioribus, pseudobulbo ovato, haud cylindrico, inter alia differt.

Herba epiphytica; rhizoma gracile, repens, pseudobulbos 2-4 cm. inter se disiunctos ferens; pseudobulbus ovatus, ad 1.2 cm. altus, basi 0.6 cm. diametro, retiforme rugosus. *Folia* sessilia, oblonga vel ovato-oblonga, apice bilobulata, ad 4 cm. longa, 1 cm. lata. *Inflorescentia* subcapitata, 3-6-flora; pedunculus communis ad 4 cm. longus, basi pseudobulbi oriens, vaginis amplis duabus vestitus; bracteae ovatae, obtusae, 2.5 mm. longae, 1.5 mm. latae, 1-nervatae. *Sepalum intermedium* oblongo-ovatum, 5.5 mm. longum, 1.25 mm. latum, 3-nervatum, versus apicem margine leviter involutum; sepala lateralialia oblongo-triangularia, 5.5 mm. longa, 1.5 mm. lata, aliter sepalo intermedio similia. *Petala* ovata, obtusa, 2.5 mm. longa, 1.5 mm. lata, 1-nervata. *Labellum* carnosum, triangulum, obtusum, 2.25 mm. longum, decurvatum, paulum lateraliter compressum, superne profunde canaliculatum, breviter stipitatum, haud auriculatum. *Columna* 1 mm. longa, brevibus fere rectis stelidiis, pede ultra insertionem sepalorum lateralium producta.

Doi Suteh, 1200-1500 m., on trees in evergreen forest, flowers greenish-yellow, *Kerr* 102 (*type*). Doi Chiengdao, 1300 m., on trees in open evergreen forest, *Kerr* 0253.

Bulbophyllum Noeanum *Kerr* [Orchidaceae—Epidendreae]; species sine congeneribus intime propinquis, *B. eublepharo* Reichb. f., remote affinis, sed petalis haud fimbriatis, segmentis perianthii multo longioribus angustioribus valde distincta.

Herba epiphytica; rhizoma 5 mm. diametro, repens, pseudobulbos inter se 2.5-4 cm. disiunctos ferens; pseudobulbus 1.5 cm. altus, ovatus, unifolius. *Folia* petiolo ad 11 cm. longo suffulta, lamina coriacea ad 19 cm. longa et 6 cm. lata oblongo-ovata vel oblongo-obovata apice obtusa leviter bilobulata basi in petiolum sensim attenuata. *Inflorescentia* e basi pseudobulbi oriens; pedunculus communis ad 20 cm. longus, 4-5 vaginis; racemus ad 20 cm. longus, multiflorus; bracteae ad 8 mm. longae, 1.5 mm. latae, acutae; pedicellus cum ovario 1.2 cm. longus. *Sepalum intermedium* lineari-oblongum, acutum, 13 mm. longum, 2 mm. latum, 3-nervatum, intus pilis glanduliferis instructum; sepala lateralialia

15 mm. longa, 2 mm. lata, ceteribus sepalo intermedio similia. *Petala* ovata, longe acuminata, 10 mm. longa, 1.5 mm. lata, pilis brevibus glanduliferis dense instructa. *Labellum* 3 mm. longum, 0.75 mm. latum, oblongum, decurvatum, superne sulco linea elevata utrinque marginato e lacuna triangulari basi oriente, versus apicem decurrente auriculis parvulis rotundatis integris. *Columna* carnosa, 2 mm. longa, stelidiis rectis gracilibus.

Pattani, Kao Kalakiri, 900 m., on trees in evergreen forest, sepals and petals greenish-yellow, sepals with three longitudinal purple lines, petals with one, *Kerr* 0013.

Named in honour of Nai Noe Isanguara, my companion in many botanical trips.

Sacciolepis tenuissima C. E. Hubbard [Gramineae]; affinis *S. huillensi* Stapf, sed culmis gracilioribus multinodis, panicula brevior et spiculis pubescentibus differt.

Gramen annuum. *Culmi* erecti vel geniculato-ascendentes, 15-50 cm. alti, tenuiter filiformes, gracillimi, diffusi, debiles, glabri et laeves, ramosi, multinodi, nodis glabris vel obscure pubescentibus. *Foliorum* vaginae solutae vel superiores arctae, internodiis breviores, tenuiter striatae, subauriculatae, glabrae et laeves; ligulae truncatae, brevissimae, membranaceae, albiae; laminae anguste lineares, obtusae, 2-10 cm. longae, ad 1.5 mm. latae, planae vel involutae, strictae vel flexuosae, debiles, tenues, glabrae et laeves. *Panicula* spiciforma, cylindrica, 0.75-1.5 cm. longa, 2.5-3.5 mm. lata, densa, contigua, longe exserta; pedicelli binati, graciles, 0.3-0.7 mm. longi, adpressi, scaberuli. *Spiculae* oblique ovatae, acutae vel obtusae, 1.2-1.5 mm. longae, sparse pubescentes, prominenter nervosae, pallidae. *Gluma* inferior reniformi-ovata, subobtusata vel tenuiter acuta, 0.75 mm. longa, trinervia, hyalina, glabra; gluma superior ovato-elliptica, obtusata vel rotundato-obtusata, 1.5 mm. longa, sparse pubescens, 7-9-nervia, membranacea. *Anthoecium inferum* vacuum; lemma ovatum, obtusum, 1.5 mm. longum, sparse pubescens, 7-nervium, membranaceum; palea linearis, obtusata, 0.4 mm. longa, hyalina. *Anthoecium superum* ♀, ambitu ellipticum, utrinque subacutum, 1 mm. longum, nitidum, albidum; lemma et palea tenuiter chartacea, enervia. *Caryopsis* 0.8 mm. longa.

Chantaburi: Chantabūn; Tārūang, c. 100 m., common in savannah, Dec., *Kerr* 9732 (*type*). Rāchasimā: Kōrāt; Chan Tūk, c. 300 m., among low herbage on open ground, Dec., *Kerr* 8061.

XXIX.—MISCELLANEOUS NOTES.

MR. H. RITCHINGS and MR. F. S. BANFIELD, Student-Gardeners, Royal Botanic Gardens, Kew, have been appointed by the Secretary of State for the Colonies, Horticultural Assistants, Federated Malay States.

LUDWIG RADLKOFEK.—The death of Prof. Ludwig Radlkofer, which took place at Munich on February 16th last, removes from the

ranks of botanists one whose record for longevity and prolonged activity is probably not easily surpassed. His published papers cover a period of seventy years and the fact that he took an active part in the controversy between Schleiden, v. Mohl and Hofmeister, on the fertilisation process of Angiosperms is evidence of a career that extended over three generations.

It is remarkable that Radlkofer spent practically the whole of the ninety-eight years of his life in his native town. Born at Munich in 1829, he graduated there in 1854, became "Privatdozent" in 1856, and by 1863 had attained a full professorship. He ceased to take an active part in the ordinary teaching work of the university in the nineties of the last century, but he continued to supervise research workers and to act as Director of the Botanical Museum to the last. His end came rather suddenly, but up to that time he had retained his full vigour, and I am told that he rarely missed faculty and other university meetings.

Although some of his early work lay in other directions, he devoted most of his life to systematic botany. He was known as an authority on the *Sapindaceae*, being responsible for the sections dealing with this family in Martius' "Flora Brasiliensis," and in the "Naturliche Pflanzenfamilien." At an early stage of his career he became a prominent supporter of the use of anatomical characters for taxonomic purposes, and he demonstrated their value in numerous communications. A continuous stream of dissertations and other papers dealing with the systematic anatomy of the diverse families of Dicotyledons issued from Radlkofer's laboratory and towards the end of the century his pupil, Hans Solereder, collected together this large mass of material, much of which was relatively inaccessible, in "The Systematic Anatomy of Dicotyledons," in the introduction to which a glowing tribute is paid to Radlkofer as the chief originator of the anatomical method. In the course of his long experience Radlkofer acquired a very intimate knowledge of the anatomy of Dicotyledons, and he became an adept at the determination of sterile herbarium material, for which his aid was sought from all quarters. He was fond of narrating, at the expense of the Kew Herbarium, that on the occasion of his last visit, many years ago, a demand for a microscope led to the production of an old instrument covered with dust and unearthed from the top of one of the cupboards.

F. E. F.

CHARLES SPRAGUE SARGENT.—Kew is happy in having scattered throughout the world numerous friends, whose sincere and constant interest in its fortunes have helped it greatly to attain the position it now occupies. Amongst them there is not one whose memory will evoke a greater sense of gratitude than Charles Sprague Sargent, whose death on March 22nd, 1927, we have to deplore. For more than fifty years he, as Director of the Arnold Arboretum, has been a continuous and generous contributor to our collections of hardy trees and shrubs, and their present magnificence is very largely due to his assistance. Although Sargent was himself a keen collector, he never

succumbed to the collector's great failing—the desire to be the only possessor of a specimen. However rare a plant that he had succeeded in obtaining might be, his aim invariably was to propagate and distribute it. We are happy to acknowledge that Kew was always one of the first recipients.

Sargent was born on April 24, 1841, and graduated at Harvard University in 1862. Soon after that he joined the Federal Army and served during the American Civil War, ultimately attaining the rank of Major. On his return to civil life he took up the study of botany, more especially that of the trees of North America. In 1872, largely due to his individual efforts and influence, the Arnold Arboretum was established at Jamaica Plain on the outskirts of Boston, Mass. It is really part of the botanical equipment of Harvard University, and Sargent was appointed its first director. The fifty-five years during which he held that position saw its development into one of the most important scientific institutions in the world, a position which it may be said to owe almost entirely to Sargent's ability, energy and influence. Greatly also has it benefitted by his private generosity, especially in regard to its library, the foundation of which was laid by the gift of six thousand of his own books.

Of the various works that have come from Sargent's own pen the most important is "The Silva of North America," which appeared in fourteen quarto volumes between 1891 and 1902, illustrated by 704 plates. It is one of the most sumptuous of all botanical works. Other books of which he was the author were, a "Manual of the Trees of North America" (an abridgement of the "Silva"), and the "Forest Flora of Japan." To "Garden and Forest," a weekly periodical which he founded in 1888, he contributed many articles during the ten years of its existence. Of works he edited the most important are *Plantae Wilsonianae*, a description of the plants collected in China for the Arnold Arboretum by E. H. Wilson; the "Bradley Bibliography," a list of books and papers relating to all woody plants published in all languages down to 1900; and "Trees and Shrubs," an occasional publication.

Sargent was an assiduous traveller in his own country and is reputed to have seen all but two or three of the species of trees native of the United States growing wild. He visited Japan in 1892—a journey that proved fruitful in the introduction of many trees and shrubs to the United States and England, and one result of which was his "Forest Flora of Japan," adverted to above. He also paid frequent visits to England, the last in July and August, 1914.

Sargent was a man of magnificent physique, with a fine, strong, and, in his latter days, somewhat rugged face. His features were a true index to his personality, the most prominent characteristics of which, perhaps, were his masterfulness and his indomitable perseverance. When once he set his mind to do a thing it took much to turn him from his goal. Such a character, especially when it came in contact with others of similar calibre, naturally aroused strong antagonisms, but these were more than balanced by stronger friend-

ships. To his faculty for enlisting powerful help the present eminence of the Arnold Arboretum may in a great measure be ascribed. He was a charming host, as visitors from this country to his home at Brookline have grateful cause to remember—not least those who went from Kew. We trust that although he has gone, the Arboretum may carry on its splendid work without interruption. It would be a grievous calamity if its fortunes suffered any relapse. Just as St. Paul's Cathedral is properly recognised as Wren's great monument, so, we hope, may the Arnold Arboretum come to be regarded by future generations as Sargent's chief memorial. The epitaph to Wren in St. Paul's—"Si monumentum requiris, circumspice"—might also, with equal truth, be inscribed on the gates of the Arboretum in memory of its creator.

ABERCROMBIE ANSTRUTHER LAWSON.—The sudden death of Prof. A. A. Lawson, which occurred on March 26th, will be deeply regretted both by his many friends and by the wide circle of botanists who are acquainted with his scientific work.

Lawson was appointed Professor of Botany in the University of Sydney in 1912, and, from that date onwards, has occupied that post with unqualified success. The classes in Botany increased greatly in size during his Professorship, and, apart from the heavy work involved in arranging lectures and laboratory work for these, a large amount of research has been carried out by Lawson himself, by his assistants, and under his direction. Besides this he devoted much care and attention to superintending the erection and equipment of the new buildings which form the present School of Botany of the University (*K.B.* 1926, p. 222), and which, to quote from an account in a Sydney newspaper, are "now considered to be one of the finest institutions of its kind in the British Empire."

Lawson, who at first intended to enter the medical profession, found, while studying Botany under Prof. F. O. Bower at Glasgow University, that this subject appealed to him so strongly that he gave up his original intention and made Botany his profession. After graduating at Glasgow, he went for a time to the University of Toronto, and afterwards to Leland-Stanford University, California, where he became Instructor in Botany in 1904 and Assistant Professor in 1905. In 1906, he spent some time at Bonn, working in Prof. Strasburger's laboratory, and in 1907 he left Stanford to take up the post of Lecturer in Botany in Glasgow University, where he remained until his appointment to the Chair of Botany in Sydney.

The numerous contributions to botanical science published by Lawson deal chiefly with cytology and morphology, and include a series of papers on the gametophytes and embryo of several species of Conifers, the research work in some cases having been carried out in the Jodrell Laboratory at Kew. Among other important publications are papers on the prothallus of *Psilotum* and of *Tmesipteris*, both published in 1917. In recognition of the value of his scientific

researches, Lawson received the award of the gold medal of the Royal Society of Edinburgh, of which he was a Fellow, and in the present year he was selected for election to the Royal Society.

Lawson was keenly appreciative of the beauty and value of Kew and found a special attraction in the extensive collection of Conifers. On the occasions of his returning to England from abroad, he always made an early visit to Kew, more often on the day of his arrival.

Fifth International Botanical Congress, 1930.—At the International Congress of Plant Sciences held at Ithaca in August last, an invitation was conveyed from British Botanists through Dr. A. B. Rendle, Dr. A. W. Hill and Dr. E. J. Butler for the Fifth International Botanical Congress to be held in England in 1930. The invitation was accepted by the Botanists assembled at Ithaca and arrangements are now being made for the Congress to be held at Cambridge in the middle of August, 1930, when it is hoped that many botanists from all parts of the Empire will be present.

An Executive Committee has been formed to make arrangements for the Congress, consisting of Prof. A. C. Seward (Chairman), Dr. A. B. Rendle (Treasurer), Sir David Prain, Prof. A. G. Tansley, Prof. V. H. Blackman, Dame Helen Gwynne-Vaughan, Dr. A. W. Hill, Prof. W. Neilson Jones and Prof. Walter Stiles.

It has also been decided to organise the Conference in the following seven sections: Morphology (including Anatomy), Taxonomy and Nomenclature, Plant Geography and Ecology, Palaeobotany, Genetics and Cytology, Physiology, and Mycology and Plant Pathology.

Mr. F. T. Brooks, The Botany School, Cambridge, and Dr. T. F. Chipp, Royal Botanic Gardens, Kew, have been appointed Joint Secretaries of the Congress, and any communications with regard to the Congress should be addressed to one or other of the Secretaries.

Indian Palms.*—The last general account dealing exclusively with the Palms of India and Ceylon was published in 1893 by Dr. O. Beccari and Sir J. D. Hooker in the *Flora of British India*, and since that time various important generic monographs and scattered papers on the subject have been issued. The Rev. E. Blatter has now brought this information together in one volume, in which he has adopted Drude's classification in Engler and Prantl's *Pflanzenfamilien*. After an introductory chapter on structure and classification, detailed accounts are given of the various species and include references to literature, vernacular names, uses and cultivation. The book is illustrated with 103 plates from photographs, besides text figures and has a bibliography of 28 pages. The work should form a useful guide to those interested in Indian Palms.

C. H. W.

* The Palms of British India and Ceylon, by Ethelbert Blatter, S.J., Ph.D., F.L.S. Oxford University Press, 1926. Pp. xxviii + 600, plates 106, text-figs. 49, maps 2. Price 45s.

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